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EXTENSION OF THE LONG ISLAND RAILROAD.

It is probably known to most of our readers that the Long Island railroad, intended to extend from Jamaica to Greenport, near the eastern end of the island, has remained uncompleted, and hitherto with but little prospect of a completion. The road having been made as far as Hicksville, sixteen miles, the whole distance traversed (including the Brooklyn and Jamaica railroad, which is leased by the Long Island railroad company,) has been but twenty-seven miles from Brooklyn.

During the past year, vigorous efforts have been made to renew the work. Aided by a legislative grant, by the donations of land and money from the inhabitants, and by the direct expenditure of the company, the means have been obtained for building *twenty miles* of road, in addition to the portion already finished. About seven of these twenty miles have been prepared for travel, and the company desirous of showing how much had been done, and how favorable the nature of the ground continues throughout the route, a large company assembled on the 2d inst., by their invitation, to pass over the road as far as finished.

Some idea of the admirable facilities of the route may be formed from the fact, that the sixteen miles of road which have been built for several years, form a perfectly straight line, the surface being but gently undulating, and the grades light. This being the fact, we could not but express our surprise that an excavation of some eight or ten feet should have been continued for a great distance over a plain,

through which the road might as well have passed on or near the surface of the ground. We learn too, that this portion of the road causes great trouble in winter by the snow sweeping over this wide expanse, uninterrupted by a fence, and filling up the road way, causing vexatious delays, and sometimes actually interrupting the travel.

There is probably no better ground for a railroad in the world. The soil, which is not deep, but very dark in color, being removed, a beautiful white gravel, resembling ordinary beach shingle, is uncovered, and through this, excavation is readily made, while a uniform material is presented both for excavation and embankment, and of the very best kind.

Hicksville, the former termination of the road, is situated in the middle of Hempstead plains, and at a short distance to the west a branch has been made to the village of Hempstead. From Hicksville, the line of the road as formerly located, pursuing the direct route through the middle of the island, passed over a transverse spur at a great cost of excavation and embankment.

At this point the work has been re-commenced and the old route abandoned The road as constructed sweeps to the south and touches only the extremity of the transverse ridge, where but a slight excavation is necessary. A slight curve returns the road toward the middle of the island, and after some gentle undulations, the plain ground again occurs with the gravel, which in this case has a tinge from the iron in the minerals of which it is composed, and which gives a greater tenacity to the earth.

The termination for the present is at Farmingdale, formerly Bethpage, but as about a mile of the track had been laid beyond this, the locomotive passed over it for the first time and an opportunity was afforded to the company of examining the actual construction of the road. The point at which the line of rail terminated, was to us one of singular interest. The plain is here entirely covered by a species of scrub oak (Quercus Bannisteri) not exceeding the height of a man and so completely covering the ground by its spreading and interlacing branches, that at a distance, the rich mass of foliage appears like a coating of dark grass upon the ground. The extent of these plains is very great, and in them large numbers of deer are shot annually. The surface is so level and favorable, that a straight line of twenty miles or more, is here obtained for the road.

Indeed we do not think that in the whole history of railroads there has been found a similar extent of country offering so perfect

a surface for the construction of a road, and one so entirely free from all soft or perishable material. At the same time, we conceive that great credit is due to the engineer, Mr. Shipman, who, assisted by Mr. Shotwell, has re-located the road with the greatest economy, and uninfluenced by the more costly style of the former portion of the road, has aimed at what is most requisite, the speedy and economical construction of the road to its termination, as the interests of the concern demand the earliest possible command of the Boston travel, after which it will be an easy matter to improve those portions of the work which need further outlay. But while we characterise the work as economical, we do not wish to be understood that security or convenience has been sacrificed, on the contrary, a heavy rail has been used, 56 lbs. to the yard, and laid on an adequate foundation.

On the return of the company to Farmingdale a very substantial repast was provided, and after paying due attention to it, a number of very happy sentiments were given. The party consisted chiefly of those by whom the railroad system had received much attention, and had been properly appreciated. The Mayor and Common Council of Brooklyn, several members of the Common Council of New York, the directors and officers of the Long Island, and Brooklyn and Jamaica railroads, the president of the Harlem and the vice-president of the New York and Albany railroads, Mr. Davis of New York, Capt. Perry and others were present, and addressed the company. With the utmost good feeling on all sides, was combined the warmest devotion to the cause of railroads, particularly in reference to our great commercial focus.

Mr. Fisk, the president of the Long Island railroad company, gave a very plain and gratifying statement of the prospects of the work, of its economical management, and the successful removal of obstacles of various character. Indeed it is well known that to this gentleman is chiefly due the credit of resuscitating the work, and amid the numerous difficulties attendant upon it, of directing the financial department upon which its prosperity depended. Mr. F. highly complimented Mr. J. A. King, the former member from Queens, by whose exertions the legislative aid was obtained.

There are few routes of greater interest and more deserving the encouragement of the inhabitants in its vicinity. Long Island has long been considered as the garden of New York, but while the western portion has more properly deserved that title, the eastern and more remote parts have been so much separated by distance, that they have hardly received the attention which their importance

and magnitude have deserved. By the completion of this road an opening far more expeditious, certain and economical, than any other, is afforded for the vast traffic of the island, and how much this traffic may be increased, it is almost impossible to imagine. However important this road may be as a route to Boston, we think that as a route through the island it is far more important. This is essentially a farmer's railroad, by them it should be supported and for their interests it should be directed. It is in the power of this work to build up a population and a consequent traffic that shall excel that of any other road in the United States. Although this result may be calculated on with certainty, it cannot be attained unless the proper direction is given to the enterprise. If however the vigorous efforts which have been made, are continued, and the same perseverance is shown in the conduct, that has been manifested in the prosecution of the road, the true policy will soon be ascertained and acted upon.

Since commencing the above, we have learned with pleasure, that eleven miles more have been prepared for travel and will be opened in a few days. That an equally rapid progress to the end of the road, may reward the exertions of its friends, is our heartfelt wish.

[For the American Railroad Journal and Mechanics' Magazine.]

Your correspondent X's inquiry in the Journal for the 15th July, relative to the *Wire Suspension Bridge at Frybourg*, can be answered by a satisfactory account, I owe to a friend, who examined that bridge about a year ago. Until that time that superb structure had ably sustained the heaviest loads and its well established reputation of solidity and safety. A heavier and stiffer construction of its platform would have been a desirable improvement, as likewise an efficient system of under floor stays; its vibrations however are of less magnitude than those of most of the English chain bridges.

Speaking of Suspension bridges, I take this opportunity of commenting upon an article of M. Le Blanc, on the comparative merits of chains and cables in the same number of your Journal.

Le Blanc is quoted to say, that the imperfection of the present process of manufacturing cables does not allow of an equal tension in all the wires, so that when the cable is raised to its place, the wires under most tension are overstrained by many pounds, while those under the least tension do not draw at all.

I confess, that by the methed of the French engineers it appears

indeed impossible, to attain a uniform strain. Changes of temperature, which can by no means altogether be avoided, will, during the manufacture of a heavy cable, produce considerable contractions and expansions of the different wires, as they are put on in succession. A uniform tension, the most desirable object in a cable, is therefore partially defeated.

This great defect however, may be avoided by employing a process different from the French, and also less expensive.

The method I allude to, appears to me indeed, so certain and sure, that I hereby do offer to manufacture cables of the largest dimensions, for suspension bridges or inclined planes or other purposes, where heavy weights are to be supported, so perfect that the tension of the different wires, say from No. 10 to 15 must not vary *one* pound.

To give due weight to my assertion, I will add, that I have just finished a wire cable of 600 feet long for an inclined plane, where I have applied the above mentioned process with the best success.

After a patent right has been secured for my improvements in the manufacture of *wire cables*, then my interest will admit to say more about it.

JOHN A. ROEBLING,
Civil Engineer.

SAXONBURG, PA., *Oct.* 27, 1841.

INSTITUTION OF CIVIL ENGINEERS.

Having read with pleasure the communication signed G. R. R., in the No. of the Journal for the 15th of August, the writer takes the liberty of making some remarks upon the subject, and of calling the attention of the members of the Profession to the letter in question.

If but a small number of engineers should enter into the views of G. R. R., and follow them up in the spirit which he shows, there is no fear that the Profession will long remain without efficient organization. The true mode of proceeding, is, carefully to avoid the errors which have caused the previous failures, and seeking only to bring about the main objects of such an association, to leave all small matters for after consideration, and with a mutual good feeling and spirit of concession, these will undoubtedly be looked upon only as subservient to the chief end.

The writer of these remarks is under the impression that the failure of the Baltimore convention was caused by the attempt to locate the association, and by the exclusive character assumed, chiefly on account of the expensive annual dues. That the attempt to

locate the institution should prove a serious obstacle in the outset, is not surprising. Local prejudices were immediately called into play, and the hearty co-operation of a large part of the profession at once rendered impossible. The feeling that generally prevailed, that directly or indirectly a connection with any existing association was contemplated, rendered these prejudices still stronger, while the distance constantly to be travelled before each meeting, was an impediment that assumed a formidable character, merely from the fact, that an unequal tax was laid upon the time and money of the members.

The expensive annual dues, gave an exclusive character, by at once setting up a standard, which, instead of measuring the professional zeal or merit of members, seemed rather to contemplate the length of their purses. All the members of any one Profession are never found to be equally successful, and to imply that those only who were so, afforded the proper elements for an association would be absurd and unjust. The distinction of members and associates is also one of doubtful utility. The fact that this distinction has been made in the British Institution, probably led to the attempt to introduce it here. But it must be recollected that the spirit and manners of the two countries are essentially different, and that these affect the relative position of engineers as much as any other members of society. Let the term Civil Engineer be adopted in its broadest sense, and respectability of character, and professional merit, and intelligence, be the qualifications, and no harm will result from the operations of an institution thus organized, for it will not be likely that any will seek to associate themselves with it, unless they have common interests; and to exclude such, would be a real injury. But we have the experience of such distinctions in our own country, and it is uniformly opposed to such an organization as would be desirable in an association of civil engineers—party feelings—dissatisfaction and servility, are the necessary results; and the tendency is always to consolidation; whereas the very reverse is to be aimed at in the proposed body. It is not intended to insinuate, nor is it imagined by the writer of these remarks, that the gentlemen who drew up the constitution proposed in 1839, had any such views, but it is only meant that such results were anticipated from the system then adopted, and that this impression was so general as to cause its ultimate failure.

What we want is first—concert of action and some general plan of union, and to this every thing else must be sacrificed. Unless this grand object is carried out, any society that is formed must finally become a local club and local in all its interests and feelings.

The previous discussion of the question can do no harm, and by a free interchange of opinion much good may be done. The following hints are respectfully offered for consideration. It is thought by many, that a plan of meeting similar to that of the British association, would answer better than any other. Let some suitable place be named each year as the point of assemblage, and let the selection depend upon the wishes of the majority, guided as they would be by a desire for mutual accommodation and benefit. There can be no doubt that a body respectable as this should and would be, might make suitable arrangements that its members receive free passage on the various railroads on their route going and returning, this would at once remove the objection of expense. To this plan of meeting, there is but one objection, and this is really of no consequence—we allude to the inability of forming a deposite of books, maps, models, etc. If such a deposite was actually formed, how many members even of those resident near the location, could avail themselves of such a collection? In the case of a school of engineering, this would indeed be a matter of moment, but as the end proposed is mutual information, to this end every thing else must subserve. By such a plan too, much expense might be saved, as there could hardly be named a place of meeting in which one or more scientific associations would not be able and willing to afford suitable accommodations.

In the next place, let a new president be elected each year, the happy effects of such a provision are too obvious to need any further remark. The same rotation might also take place in all the offices, excepting perhaps such as require the attention of the same person for successive years, and as these would be offices rather of labor than honor, there would be no difficulty, except to induce any one to take them.

The yearly contribution should be moderate and only intended to pay the actual expenses including sums appropriated for investigations. The labors of the members rather than their money, should be required and every inducement and encourangement should be offered to members in bringing forward their personal experience and observation. Even the personal attendance of members would not on this plan be necessary, although very desirable.

The evil of almost all associations, is the accumulation of a vast paraphrenalia of officers, councillors, etc., ect., and a corresponding scramble for situations. Too much time is wasted in going through these endless details of elections, appointments, etc., etc., and the true business is proportionably neglected.

If a sufficient number can be assembled and the proper spirit is shown, there will be with some such arrangements as those proposed, no fear that time will be wasted or unpleasant feelings aroused, but there is a certainty that the most happy results will follow, and the association become a source of honor to the profession and of pleasure to its individual members. *C.*

RAILWAY FROM HARRISBURG TO SWATARA OR PINEGROVE COAL REGION, IN SCHUYLKILL COUNTY.

The Pennsylvania Harrisburg Intelligencer furnishes the report of a committee appointed to collect facts in reference to the advisableness of constructing the above road, and which is strongly urged by them, the ground admitting of a descending grade of 15 feet to the mile for the whole distance of 35 miles in the direction of the trade, and consequently adapted to the cheapest transportation. The very best kind of road, with a heavy rail of 50 pounds per yard is very properly recommended as the only suitable construction,—the Philadelphia and Pottsville railway being referred to as a model.

The following description is given of the region from which this railway is to derive its trade.

"Extending from the head waters of the Schuylkill more than twenty miles to the head springs of the Susquehanna; comprising seven mountains of coal broken by creeks, exposing the coal in breasts of 6, 7 and 800 feet above the water in thirty-six gaps at the mountain ends; embracing every variety of anthracite from the inflamable Welsh coal of black and gold mine gaps, to the hard white ash of the broad mountain: containing the largest body of free burning red ash coal, in Pennsylvania; and also grey and white ash coal in inexhaustible quantities, this Swatara coal region is capable of supplying any amount of coal which the market may demand.

"There is at present but little more than one mile of railroad now made in this region. All the remainder of this extensive coal field lies waste and profitless. This is on Lorberry creek, where three or four operators now mine about 30,000 tons annually. This quantity now finds its way on a badly constructed wooden railroad five or six miles long to the union canal at Pinegrove; at an expense nearly equal to that on a good iron railroad to Harrisburg. From Pinegrove it is shipped into twenty-five ton boats, and traverses the union canal 52 miles before it reaches the Susquehanna ten miles below Harrisburg. The present state of the union canal, in addi-

tion to its small capacity, is unfit for the coal trade. Every dry summer the navigation is suspended. The company is too poor to widen the canal, build reservoirs, or make repairs. It has lately made an assignment for the benefit of its loan holders, and therefore all hopes of an outlet to market by this canal seems to be at an end. But was it widened at an expense of $1,000,000, it is believed a well constructed railroad to Harrisburg, costing not more than one-third that sum, would answer a better purpose, as it shortens the distance nearly one half."

Thus it is seen from the above discription, that this Pinegrove region, is fully equal to that of Pottsville in variety of quality and inexhaustible stores of coal, and in fact may be considered preferable as being scarcely yet touched. Mining would here be cheaper and it is capable of being brought quite as near as Pottsville by railway, to the great mart for export at Philadelphia. We do not ourselves see the merits of giving at present, the outlet for this valuable region a westerly direction towards Harrisburgh, and after seeing the operation of the Philadelphia and Pottsville railway, it is more than probable a reconsideration of the subject will lead to the adoption of a continuous railway to Philadelphia. The portion to Reading from Philadelphia is already in operation 54 miles, it remains then only to invite a branch from thence towards Womelsdorf, or further on, say 20 miles, to be met by one of 20 to 25 miles from Pinegrove, making the whole line between it and Philadelphia, about 100 miles, and the connection might afterwards be completed with Harrisburg. The grades in the direction towards Philadelphia are all of a *suitable* character.

All mixed modes of transit, involving transhipments and frequent handlings should be avoided when possible, the railway and canal or river, work as little together as oil and water. Water-links are ever uncertain, and are one-third of the time positively useless, how unsuitable a clog are they therefore upon the incessant operations of a railway, and the more particularly so in this case, with a termination no where, that is at Havre de Grace, which will take a quarter of a century to grow into a coal mart, while in the other direction at Philadelphia, the consumption is already between one and two hundred thousand tons, with an export demand of at least from 4, to 500,000 tons more, which also will be continually on the increase. Harrisburg might be a point of delivery, if it could be made the head of sloop navigation for 150 ton boats, which could clear direct for eastern ports, but such a contingency is too remote, even

were it practicable. The cost of mining coal in this region, and delivering it at Havre de Grace by railway and canal is thus stated.

	Per ton.	
Mining - - - -	$ 50	
Screening and loading cars -	- 12½	
Mine rent - - -	- 25	
Profit of miner - - -	- 50	
		$1 37½
Transportation to Harrisburg by railway 35 miles - - -	70	
Transportation to Havre de Grace by canal 71 miles - - -	1 06½	
		$1 76½
Waste - - - -		25
		$3 39 per ton.

By the proposed continuous railway to Philadelphia, it could be delivered on the same terms, with the advantage of a sure market, and *without any interruption during the whole year.* Under these circumstances, it would be no wonder to see the Pinegrove region very soon rivalling that of Pottsville in the amount of its trade.

The coming season of 1842 will be one of unusual interest in the coal trade, particularly if the canals are all spared from freshets, and are enabled to open early in the spring, when the several regions will find themselves in hard conflict. The Lehigh and Lackawanna, versus the Schuylkill region with two avenues of railway and canal, which, despite their enmity, will be compelled to co-operate in maintaining the ascendency in cheapness, of their own region, while the consumer will be too glad to have the contest rage, as the party sure to profit by it.

EXTRACT FROM "A SKETCH OF A RAILWAY JUDICIOUSLY CONSTRUCTED BETWEEN DESIRABLE POINTS."

The construction of the New York and Albany railroad, 15 to 25 miles from the Hudson river, and running parallel with it, is about to be undertaken in earnest. That railways should pretend to contend against canals for freight, although that were considered presumptuous enough, was not so much wondered at; but that they should offer to compete *in any way* with the mighty Hudson, that truly great natural stream, in which the *auxiliary element* is found "without stint and without cost," is generally considered in New York as truly chimerical. Greater wonders than this, however, have been realized. Mr. Wood, for instance, the able editor of the "Practical Treaties on Railways," when it was advertised in England that a locomotive on the Liverpool and Manchester railway would be made to proceed at a rate of 15 to 18

miles per hour, interested himself to have the announcement suppressed, as being too absurd, and therefore injurious to the cause; yet Mr. Wood was, shortly after, carried himself at the rate of 40 miles per hour, and although the ground is much narrowed of late for equal progress, yet there is continued evidence of advances in one or other branches of the railway.

It is shown in note No. 11, that in the south, rivers using steam are being *deserted* for the railway. The same cause should have the same effect at the north. In one sense, for the freight from and to Albany and New York, during the season of navigation, it is not pretended that the railway would attempt to compete with the river, but in other senses *sufficient to warrant the work, it can do so effectually*, and its advocates are fully justified in urging both its importance and its *profitableness* upon the community. The following is a summary of the reasons urged by them in its favor, which it behooves every New Yorker to examine and fully to understand, as his decision, either way, must be fraught with important consequences to himself and to his posterity. (See report of the Common Council of the city of New York for 1840 on this subject.—Document No. 10.)

1. Authentic statistics show that apart from the river, on the *line* of the road, the tonnage now got to market at great expense, is at least 100,000 tons.

2. That the summer travel for eight months, in 1839, was 3,500 per day, exclusive of sloops and market boats, or equal to through passengers, *each way*, per day, between Albany and New York, 1,000.

3. That once the competition by railway was open, and the travel *divided* with the river, the number now crowded into each boat would cease, and the two conveyances would then carry about an equal number of through passengers per day each way, far more comfortably.

4. A steamboat, costing $70,000, capable of accommodating properly the above number, would cost in fuel, wages, wear and tear, insurance, etc., about $2 per mile, performing the trip, on an an average, in 10 to 11 hours.

5. The locomotive and train, costing together $20,000, capable of accommodating properly the same number, would cost in fuel, wages, oil, wear and tear, including *charge for repair of road*, 80 cents per mile, performed on an average in seven hours.

6. The following is the data upon which the above statements are made: first, as regards the expense of running a steamboat on the North river. At present wood is the fuel generally used, but anthracite coal is being introduced with apparent present economy, but it is yet doubtful if it will be found so ultimately, the heavier boats, with large fire surfaces, not being able to dispense with the blower it is said, and which is found injurious to the boilers. Nevertheless, for ferry boats, tow boats, etc., the use of coal is increasing, particularly with those on the sound.*

* This has reduced the price of wood to $4 per cord for Virginia pine, which used to sell at $5 and $5 50 per cord. The engineers of the boats to Albany say they consume ab

Cost of boat $70,000, at 7 per cent.,	$4,900
Wear and tear, 12 per cent.,	8,400
Fuel, 220 trips, 40 cords per trip, 8,800 cords, at $5 per cord,	44,000
Insurance on $70,000, at 3 per cent., (their own underwriters generally),	2,100
Oil, tiller ropes, packing, etc.,	2,400
Wages, 1 captain, $1,500; 1 2d captain, $600; 2 pilots, $800; 2 engineers, $1,000; 6 firemen, $960; 10 deck hands, $2,000; steward, $400; 12 assistant stewards, $1,440; barkeeper, $400, together,	9,100
Deduct interest on capital, *to put it on an equal footing with the railway*,	4,900
Average trips per season of eight months 220, or equal to $300 per trip of 150 miles,	$66,000

The above then, excluding interest on capital (wood costing five to six dollars per cord, and the consumption being equal to one cord to about every four miles), brings the cost of running a steamboat on the Hudson river $300 per 150 miles, or at	per mile	$2 00
On Lake Erie, upan data given by Mr. Klein, between Buffalo and Detroit, to and fro, 720 miles, (wood costing only $1 50 or $2 per cord, and consumption as above), excluding interest on capital, the trip round costs $900, or	per mile	$1 25
A locomotive and train, equal to the same number of passengers per trip, (on an average of fuel, so important in either case), would cost, excluding interest on capital, but including an allowance for repair of road, which the steamboat has free, to be fully covered, say $80 per 100 miles, or	per mile	80 cts.*

These comparisons then show most clearly that the actual running cost without allowance for interest on capital in any case, is less by railway, but particularly in the middle States, where wood fuel is the

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one ton of anthracite to every twelve miles, or twelve tons per trip, and which is delivered at about $6 50 to $7 per ton. This would reduce the running cost of boat to $1 20 per mile or a saving over wood of 80 cents per mile, unless counteracted by the quicker destruction of the boiler.

*To accomplish the years business our trains have traversed (on an edge rail) a distance of 110,540 miles. Dividing the expense, $67,282, on this, will give the average cost of working the road 60 8-10th cents per mile run.—J. E. Thompson's report, Georgia railroad, May 10, 1841.

In 1840, on the Utica and Schenectady railroad, with a *flat bar*, the business was accomplished by the trains having traversed 145,260 miles for $119,900, equal to about 80 cts. per mile, the repairs to the road that year exceeding the preceding by $13,000, or equal to nine cents per mile. Of course these fluctuation will occur, and will vary on different roads. A fair average for roads over 50 miles, with an edge rail, would be about 75 cents per mile run, which would include *cost of transportation, motive power, and repairs to road and management.*

dearest, and performing more than the steamboat, it generally operates an entire saving to the traveller of the fare by the latter, of which we have the practical illustration given in No. 36, which shows that the railway is preferred at even a higher rate, where they run parallel.

It would, however, be best tested between New York and Albany, where it would be seen that *for the business travel* the railway would have the preference at even a higher fare, being enabled to return the traveller the same day after a respite of an hour or two at either end, which cannot be done by steamboats; the loss by which would be, to the business traveller, on an average, at least equal to a fare of $1 50 to $2 per trip. The railway would thus be a regulator of the steamboats, and without any jealous or rival feelings, they could arrange with profit to both, to accommodate the public with the choice of cheap conveyances, the immense travel in the season of navigation being sure to require both. Under the present system, the fare is very fluctuating, from three dollars down to one, the latter, however, only nominal, for besides the fifty cents for supper, the traveller finds also superadded, an extra charge of two dollars for a state-room, and from one dollar down to fifty cents for a berth, according as he may think fresh air indispensable to his comfort, or he has the choice of escaping these charges by exposure on deck to the night air. The dividends made by these steamboat companies are said not to be less than 25 to 30 per cent. per annum, and without a *regulator* may easily reach 60 per cent. per annum before long.

Compare this to the railway, affording a clean charge of two dollars, and a clear *undisturbed* delivery, in six or seven hours, without foregoing home fare, wholesome air, or suffering any loss of time, the latter often so invaluable.

7. In the winter the railway would of course be without opposition, and at $5 dollars per head the traveller would then be *far better* accommodated than he is now at $15 to $20 in a winter trip to and from Albany.

8. A *night train* to *sleep* two to three hundred passengers, as on the Baltimore road, would always be *full*. Starting at 9, P. M. and *awakening*, after an uninterrupted rest, in Albany at about 6, A. M., would be admirable as compared with the steamboat, by which you now start so as to sup away from home, and are aroused at an inconvenient hour without rest and generally from a pestiferous pillow. This could, however, be occasionally resorted to by way of a change.

9. As already conceded, the tonnage on the river in the summer to and from New York and Albany may be yielded to the river, as it can there be carried from the enormous scale of towage at about *twenty-five cents* per ton, while between those points on the railway, by *the limitation* of the *load* over the grade of 30 feet, the cost of transportation is enhanced 75 or 80 cents per ton per 100 miles. But for the greater portion of its length the road is ten to twenty miles *away* from the river, and for the *way freight*, provisions, and building materials, would be without a competitor.

For a distance, also, of near one hundred miles, from a dense business point *in the direction of the trade towards the city of New York*, the grades are moderataly descending, over which the cost of freighting, not exceeding 50 to 60 cts. per ton per 100 miles, would give the road an opportunity to attract much profitable business to it, skirting as it does the States of Connecticut, Massachusetts and Vermont, which would each furnish also their fair quota of way travel.

10. The construction of the railway, to realize all we have said above, and as a matter of pride to the State and city, should be of the *first order*. This we should say could be accomplished for four millions of dollars, which would allow for an edge rail of 56 lbs. per yard, and to be graded for two tracks for the 146 miles from Harlem river to Albany and Troy.

And how might this be contributed, with such evident advantage and honor to those who would embark in it? Thus we will say:

The State,		
Make the road bed for 146 miles from Harlem river to Troy, contributing a loan, at 6 per cent. per annum - -		$1,500,000
Residents on line of the road,		
Furnish the right of way and depots, taking stock to the amount of - - -	400,000	
The city of Albany,		
Contribute to the road in stock, say in the proportion of one-third of the amount agreed by them to be contributed to the *Boston and Albany railroad* - -	350,000	
The city of Troy,		
Contribute sufficient in stock to connect that city with Greenbush, opposite to Albany - - - - -	150,000	
The city of New York,		
Contribute sufficient in stock for the cars, motive power, and sight for depots -	600,000	
The leading capitalists of New York,		
The superstructure, to be equal to the most approved and recent models in England as to solidity, etc. An opportunity is here presented for a *lucrative investment*, which would far outstrip in utility and profit that fine structure the ASTOR HOUSE, and would be the means of more widely extending the usefulness of the intended *munificent bequest* to the city of a PUBLIC LIBRARY, say -	*1,000,000	—2,500,000
		$4,000,000

* Of this sum, about $600,000 would be required for the iron rails, a contract for which at the present depressed state of the iron trade in England, could be obtained on the most

The investment could be relied upon as yielding at least 10 per cent. nett dividend, on a capital of $2,500,000, after paying the interest on the loan from the State, and every one would feel its collateral advantages in bringing to the city the nothern and western travel at all seasons of the year, as well as greatly increasing its supplies of provisions. This subject in particular is worthy of investigation by a *special committee*, to be got up by the above parties, and its attention would also be worthily directed to the whole subject treated of in this work, as a means of refuting or verifying its statements, so important, when really based in truth, to the general interests of the country. By the 1st of November next the advantages to Boston of a connection with Albany, by railway, will develope themselves, for the especial consideration of the citizens of New York.

The tender of such a contribution as that which would furnish the superstructure should be the means of securing all the rest, and it would not be inappropriate, in that event, that the road be approached by a monumental arch, on which should be inscribed the NAME OR NAMES, of he or they, who would thus have started and inspired confidence in so *useful and necessary* a work.

As the main stem to the northern railroads, the saving and convenience to the winter travel would be immense; and who, in looking ahead three years, in which time the New York and Albany railway could be put into operation, would say that it could then want profitable occupation, considering that the present enormous travel between those points will have nearly doubled, if there be any truth in the report of the owners of steamboats, officially made to Congress, which gave the average ratio of increase in that direction at 100 per cent. for each successive period of five years for fifteen years.

It is also in similar periods, or in cycles of five years, the whole population manifests its movement, which is scarcely perceptible in its progress from the ripple to the wave, but which then declares it self in the evident enhancement of all real values; and although there will come intervals of overgrowth, which will debilitate it for a period, yet the elastic energies of such a population are sure ultimately to recover it from all adverse pressure. It is now performing a reaction of this sort.

[From the Civil Engineer and Architect's Journal.]

WARMING BUILDINGS BY HOT WATER.

The subject of warming buildings by hot water having lately excited a more than ordinary degree of interest, owing to the recent disasterous fire at Manchester, we lay before our readers a report

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advantageous terms, both as to price and mode of payment. The price for June, 1841, was per ton 8*l*., lighterage 2*s*. 6*d*., commission 3*s*. 6*d*., freight 15*s*., insurance 3*s*., together 9*l*. 4*s*., at $4 80—$4 16 per ton.

It is a curious coincidence that the same apathy should pervade the communities of New York and Philadelphia, in respect to works about equally vital to each, as the New York, and Albany, and Philadelphia and Pottsville railways. See Journal of Commerce of 23d June, as respects the first, which has, however, no immediate rival interests to shock like the second.

made to the Manchester Fire Assurance Company, by Mr. John Davies, M. W. S., and Mr. G. V. Ryder.

"Before we proceed to detail the experiments which we have made, we shall briefly describe the appearances observed, and the information obtained at a few of the principal places which have been visited. We shall then be enabled not only to confirm but to extend the statements in Mr. Ryder's first report.

It has been found, on inspection, that Birch chapel has, at various times since the occurrence alluded to in the former report, sustained much damage. Wood, matting and cushions have, in a variety of places contiguous to the hot water pipes, been charred to an alarming extent.

With respect to Mr. Barbour's warehouse, farther inquiry has fully corroborated the previons statements of its having been on fire, close to the pipes, at different times and in different places.

Of the Unitarian chapel, in Strangeways, the directors are already in possession of information from both Mr. Ryder and Mr. Rawsthorne, and this information seems to leave no doubt as to the injury which has resulted from the use of Mr. Perkins' hot water apparatus.

The heat in the Natural History Museum having been repeatedly stated to vary in different parts of the pipes, and to become, in some cases, the greatest at places remote from the furnace, the fact has been confirmed by our own observations, and by our subsequent experiments. As this circumstance has excited much interest, and been generally questioned, we shall presently endeavor to assign the cause.

The apparatus, which it may be proper to notice in refference to its general form and construction, consists simply of a long, endless iron tube, carried, in different directions, from a furnace to which it returns, and in which about one-sixth of the whole length is inserted and formed into a coil, so as to be sufficiently exposed to the action of the fire. The tube is at the commencement, filled or nearly filled, with water, which, by the application of the heat, soon begins to circulate, and, in that way, to impart an increase of temperature to the apartments which it traverses. The dimensions of the pipes are such, that on the average, eleven feet in length will contain one pint of water. Connected with the principal pipe are two others, which are opened by a screw, one to allow for the ultimate expansion, and both subservient to the introduction of water.

As far as lay in our power, we have made such experiments as occurred to us, repeatedly, and under every variety of circumstance.

Not having any instruments which would furnish speedy and adequate criteria for the determination of high temperatures, we have resorted to the inflammation of combustible bodies, and the fusion of others, depending on the recent and high authority of Professor Graham for the degrees which they indicated.

The ordinary method hitherto resorted to for ascertaining high temperatures in the pipes, is to file a small portion perfectly smooth, and observe the progressive changes of color which occur. We

did not neglect this expedient; and we witnessed, to great advantage, the successive and beautiful tints. As the temperature increased, we were presented first with a straw color, then a deep bluish purple, and finally, with a dark silvery hue. The first is said to indicate 450°, and the blue 600°.

In the Natural History Museum we applied our tests, but were enabled to do so only to a very limited and unsatisfactory extent. Mr. Walker, the proprietor of the patent right for Manchester and the neighborhood accompanied us to the establishment of Messrs. Vernon and company, engravers, where we had the opportunity of trying the system rather better, but still imperfectly. Finally, Mr. Walker acceeded to our request to have put up, on his own premises, a suitable apparatus, which was to be submitted entirely to our control. It consisted of an iron pipe upwards of 140 feet in length, 26 of which were coiled in the furnace; 20, at least, being freely exposed to the full action of the fire.

In addition to the apparatus, as at first fitted up, we had a branch pipe and a stop cock, which enabled us, by cutting off at pleasure a great portion of the circulation, to perform our experiments on a contracted scale, and under a variety of modifications.

Mr. Walker, being from home at the time, placed his foreman entirely under our directions, so that we had the opportunity of pursuing the investigation to any extent which we might think proper. It is but justice to state, that this person rendered, very willingly and with much practical skill, all the assistance which was required.

The apparatus having, on Friday the 5th ult., been fitted up and found on trial, to be in proper condition, the experiments were commenced on the following morning, at ten o'clock, when the apparatus had arrived at a suitable state.

I. *First class of experiments, viz. those made with the whole length.*

1. The pipe from the furnace became very soon sufficiently hot to singe and destroy small feathers resting upon it.

2. Speedily afterwards, the same pipe exploded gunpowder.

3. On the highest pipe, within a foot of the expansion pipe, bismuth was readily melted, denoting a temperature exceeding 470°. The pressure at this point must have exceeded 35 atmospheres, or above 525 pounds on the square inch.

4. Feathers were singed instantly, and matches lighted, at the same place.

5. Gunpowder inflamed readily in various parts of the flow pipe, and on the expansion pipe.

6. Blocks of wood, of five different species, were charred: from the dea wood the turpentine issued profusely.

7. Other combustible materials were also severally much charred.

II. *Class of experiments, with the shorter circulation. By this change a greater pressure was immediately observable, as the expansion pipe and several of the joints emitted steam, and admitted the escape of water.*

1. Cane shavings, on the pipe above the furnace, readily inflamed.

2. Lead melted at the same place; and the temperature must, therefore, have exceeded 612°. Making a rough calculation from

the table of the French Academy, which does not extend beyond 50 atmospheres, I take 612° to represent 75 atmospheres, or about 1,125 pounds pressure on the square inch.

3. Different wood shavings inflamed on the upper pipe.
4. Cotton ignited freely at the same place.
5. Matting inflamed at the same place.
6. Cotton, hemp, and flocculent matter, collected from Mr. Schunck's fustian room, ignited on the returning vertical pipe.
7. The blocks of wood, tied to different parts of the tube, were much acted upon and charred in a very short time.

Observing the expansion pipe to be in a state of considerable agitation, and warned of an explosion, the temperature was reduced, and the experiments were, for the time, suspended.

The pipes having, before three o'clock, been refilled and screwed up, for the express purpose of an explosion, the following experiments were made in the progress of the preparation :—

1. Mungeet was readily ignited.
2. Different sorts of paper and pack thread were destroyed.
3. Bismuth fused instantly.
4. Cotton inflamed.
5. Sheep's wool became speedily charred, in 2″ or 3″ after the stop-cock closed.
6. At five o'clock the sheet lead, affixed to the upright pipe, freely melted ; steam issued violently from the bend in one of the upper horizontal pipes, and, in three minutes afterwards, the explosion occurred in the furnace pipe, at the top of the seventh coil, which presented, on subsequent examination, a lateral aperture about two inches long and about one-sixteenth of an inch broad.

In the lapse of two or three minutes after the commencement of the explosion, the furnace was entirely emptied of its contents, which were propelled, in a divergent direction, like one mass of fire, so as almost to fill the apartment. The force with which the ignited embers rebounded from the opposite wall, and other obstructions, occasioned them to scatter in profusion like a shower of fire over every part of the place. The noise was so great as to bring to the spot a multitude of people from the adjoining streets. A number of articles in the shop—as, for example, packing cloth, paper, and hemp—were subsequently found to be on fire in different parts of the premises.

These appearances and their immediate effects, seem to have been precisely similar to those which are said to have been witnessed at the explosion in the warehouse of Messrs. Craft and Stell, and would evidently have been inadequate, in the same situation, to produce all the consequences.

It may be here observed, that the experiments clearly prove, that the heat, in different parts of the pipe, is not uniform. Generally it is greatest at the highest elevation, where its superior temperature appears to be of the longest duration under ordinary incidental changes. At the commencement of the operation, however, and a short time after fresh fuel had been applied, the temperature was highest in the flow-pipe contiguous to the furnace. Another circumstance, likely to produce an inequality of heat, may be adverted

to: the tubes are far from being of uniform internal diameter; the consequence of which must be, that as the same quantity of water has to pass, in the same time, through every part of the apparatus, the liquid must move with greater velocity at one place than at another, and thus, from obvious causes, develope a greater quantity of caloric. The difference is sometimes so great in the relative bores of the tubes employed, that in some which were examined, one tube had an internal diameter of 9-16ths, and another of $\frac{3}{4}$ths of an inch, that is to say, in the ratio of three to four; or, taking the relative areas or sections of the tubes, which represent the relative quantities of fluid contained in a given length, in the proportion of nine to sixteen. Thus, taking the velocity reciprocally as the section of the pipe, the velocity of the water at one part of the apparatus being represented by sixteen feet, the velocity in another part would be nine, or the rapidity of the current would be at one place nearly double that which it was at another.

It is stated, in a work recommending the hot water system, that "the application of heat fills" the ascending or flow-pipe "with minute bubbles of steam which rise rapidly to the upper part of the tube, and become there condensed into water again:" now, as condensed steam, wherever it occurs, produces seven times as much heat as the same quantity of water at the same temperature, we have, at once, a reason for the heat of the pipe being generally greater at a distance from the furnace than contiguous to it. This apparent anomaly, which has been repeatedly observed and denied, admits, therefore, of an easy explanation.

The explosion may, under different circumstances, occur from various causes.

1. As water expands in bulk about five per cent. from 40°, its point of greatest density, to 212°, the boiling point, the expansion must be very considerably more when raised to high temperatures. If, therefore, the pipes be nearly filled with water, and the expansion pipe not adequate or in proper condition, an explosion must be inevitable. Dr. Graham states, that, from freezing to boiling water, the expansion is from 22·76 to 23·76=100 to 104·4 nearly.

2. The conversion of the water into vapor, producing an expansion which is in the proportion of a pint of water changed into 216 gallons of steam, "with a mechanical force sufficient to raise a weight of 37 tons a foot high," must present a pressure upon the tubes sufficient to ensure their destruction. Dr. Graham makes a cubic inch of water to expand into 1,694 cubic inches of steam, or one pint of water to become nearly 212 gallons.

3. It has been observed, as an ordinary occurrence, by those much accustomed to the apparatus, that, in some cases, a quantity of gas is generated, and has been found to escape, in considerable quantity, when an aperture is made in the upper part of the pipes. The only gases which could be thus obtained are the elements of the water, oxygen, and hydrogen. The former would probably be taken up in the oxydation of the metal. Now the hydrogen gas, which would remain, has never been deprived of its elasticity, and never made to change its state, by any compressing force hitherto

applied. It is obvious, therefore, that inevitable danger must arise from its production. It may be worth while to remark, that air, steam, and hydrogen gas expand in the same proportion by augmentations of temperature. The law discovered at the same time, and by independent methods of experiment, arose out of the researches of Dr. Dalton and M. Gay Lussac. It may be thus expressed: Aeriform bodies expand the 1-480th part of their bulk on the addition of each degree of temperature. Thus, taking 480 cubic inches of steam or hydrogen gas at 32°, the mass becomes, at 33°, 481 cubic inches; at 34°, 482, cubic inches; and so on: or, in a general form, a bulk a raised d° of temperature becomes $a + \frac{d}{480^{\circ}}$.

4. The last source of explosion to which it is necessary to refer, arises from any casual impediment in the pipes: and it is freely admitted, that in frosty weather such an impediment is likely to occur; it has been found to result from other causes, as in the case of extraneous matter accidentally getting into the pipes, an example of which was recently presented in the establishment of Messrs. Wood and Westheads.

In a very obliging letter received, in the course of the investigation, from Sir Robert Smirke, it is stated, that, though he has "never seen the pipes heated sufficiently to ignite wood, except on one occasion," yet, "if a fire is incautiously made when there is a stoppage in the pipes from frost or other accidental cause, the pipe within the furnace may be burst or made red hot near the furnace. I have known the pipe, he adds, "so heated only in one istance, when the red heat extended to a distance of upwards of 12 feet from the furnace."

Sir Robert concludes his letter by suggesting a protective modification of the apparatus. "Therefore," he observes "to prevent the risk of fire to a building, I would never place the furnace in a room or cellar that is not fire-proof, nor would I have the pipes in any part of their circuit in *actual contact* with wood or other combustible material. Security, he continues, "is still more effectually attained by having a safety-valve upon the pipe near the furnace, by which explosion or excess of heat would be prevented."

That which has happened once, may, under the same circumstances, happen again. The exclusion from *actual contact* with combustible materials, could it be permanently ensured, would, when the red heat extended along the pipe upwards of twelve feet, afford at least, very reasonable grounds for apprehension.

On this system of warming buildings, therefore, danger must be produced from either negligence in the feeding of the furnace, or any stoppage in the pipes: the former evil may be obviated by proper precautions; but the latter, occurring unexpectedly, exists unobserved, and precaution and care must be equally unavailing."

Signed, JOHN DAVIES,
GEORGE VARDON RYDER.

March 10, 1841.

An answer to Messrs. J. Davies and G. V. Ryder's report on Perkins' System of Warming Buildings by Hot Water. By A. M. Perkins.

The excitement that has been occasioned by the destruction of Messrs. Craft and Stell's premises in Manchester, by fire, arising from the bursting of the furnace-coil of a hot water apparatus, on "Perkins' System of warming buildings by means of hot water" and the measures taken in consequence by the Manchester Assurance Company, have created an alarm as to the general safety of his plan, which the patentee feels it incumbent upon him to show is unfounded, and to prove that whenever accident has occurred, it may in every case be traced, either to the improper construction of the apparatus in the first instance, or to carelessness and mismanagement in the use of it. It appears by a report which has been extensively circulated by the Manchester Assurance Company, that a committee of the directors of that company was appointed "to inquire into the nature of the accidents which have recently occurred from the use of hot water apparatuses, and to report thereon;" in pursuance of which resolution, Mr. John Davies and Mr. George Vardon Ryder were directed "to institute a personal investigation into some of the cases referred to, and to make such experiments as might tend to satisfy their minds as to the causes of the accidents which had occurred."

In the report presented by these gentlemen to the directors, they commence by describing "the appearances observed" at some of the places which they visited. These appearances consisted of "wood, matting, and cushions, in a variety of places contiguous to the hot water pipes, having been charred to an alarming extent," and that Mr. Barbour's warehouse had "been on fire, *close to the pipes*, at different times and in different places." The Unitarian chapel in Strangeways, also showed marked "appearances," the floor being charred black, and at the Natural History Museum in Peter street, the matting on the floor had been charred, and the floor itself appears to have been scorched. The whole of these appearances were produced by one and the same cause—the overheating of the pipes; and this was doubtless occasioned by the disproportion of the furnace-grate and draught to the furnace-coil, like that erected on Mr. Walker's own premises, for the purpose of Messrs. Davies and Ryder's experiments. Mr. Rawthorne's communication respecting the Strangeways chapel affords sufficient evidence of an ill proportion and ill-constructed apparatus, the deficiency of heat, great consumption of fuel, offensive scent, and charred wood, are convincing proofs that the quantity of tubing laid down in the chapel was insufficient to afford a proper supply of warmth; and the endeavor to procure more heat by extra firing, sufficiently accounts for the great consumption of fuel, and the offensive scent given out by the pipes when thus overheated. In an apparatus justly proportioned, the water circulating in the pipes can receive but a given quantity of heat, and any fuel added beyond that point would not cause them to become overheated. It is necessary here to describe what "Perkins' system of warming" really is; for the patentee utterly disclaims the apparatus experi-

mented upon by Messrs. Davies and Ryder as his, any further than that the pipes were closed in all parts.

Perkins' apparatus, then, consists of a continuous or endless tube, closed in all parts, a portion of which is coiled and placed within a *duly proportioned* furnace; from this coil the rest of the apparatus receives its heat by the circulation of the hot water flowing from its upper part, and which, cooling in its progress through the building, returns into the lowest part of the coil to be re-heated. The expansion of the water, when heated, is fully provided for by the expansion tube, which is of three inches diameter, and of sufficient length to afford an expansion space of from fifteen to twenty per cent; this, long practice has proved, is ample for the greatest heat which can be attained by the water, as it expands only five per cent from 40°, its point of greatest density, to 212°, the boiling point. This tube is placed at the highest part of the apparatus, and is empty when the water is cold: the furnace is provided with a damper, by which the fire may be regulated at pleasure. In a well managed apparatus, this damper is in general nearly closed after the fire has become well ignited, and the draught is so regulated that little more than a slumbering fire is kept up which at once economises fuel and prevents the possibility of the pipes being overheated. The degree to which the damper should be closed, depends entirely upon the goodness of the draught; and a very few days'—even a few hours' experience will show the person in charge of the apparatus the point at which it is desirable to keep it. To most of the apparatuses recently erected by the patentee, a self-regulating damper has been attached, acting from the expansion and contraction of the pipe; when this becomes heated beyond any given point to which the damper has been previously regulated, the elongation of the pipe by the excess of heat acting upon the handle of the damper, partially closes it; the draught is thus checked and the fire lowered; the pipe consequently cools, and in cooling, contracts; the contraction again opens the damper and the fire is revived. By this action of the self-regulating damper, any degree of heat from the pipes may be maintained within a few degrees; if the damper be so fixed as to work the apparatus at 250°, it will be found that the heat of the pipes will range between 255° and 245°, whatever quantity of fuel may be thrown upon the fire; thus again the overheating of the pipes is effectually prevented, and an equal temperature at the same time obtained.

In the arrangement and fixing of any apparatus, regard ought always to be had (as has been already stated) to the due proportions of grate surface, heating surface, conducting and radiating surface, and draught; and where these have been duly observed, accident becomes impossible, even if the damper should be left wide open. It is not deemed necessary here to state the proportions the above surfaces should bear to each other, but their necessity is sufficiently obvious; an unlimited supply of heat arising from an excess of fire or heating surface and draught, with a limited means of carrying off that heat, must cause overheating somewhere, as is proved by the high temperature of the apparatuses at Birch chapel, Mr.

Barbour's warehouse, the Strangeways chapel, and the Natural History Museum; while, on the other hand, the due observance of these proportions renders an apparatus upon this system perfectly safe. Nor can it be considered that, in claiming attention to the foregoing points in constructing an apparatus, the patentee demands too much; it is the duty of every tradesman who undertakes to erect these apparatuses to understand them; and too such an one, what has been said presents no difficulties; and surely common care and the usual degree of prudence required from every person attending upon fires may reasonably be asked for in the management of a hot water apparatus.

After this brief description of what hot-water apparatus erected upon Perkins' system ought to be, it is necessary now to examine whether the apparatus erected in Mr. Walker's premises, and experimented upon by Messrs. Davies and Ryder, is to be considered as an apparatus on Perkins' system, and what degree of weight ought to be attached to experiments conducted as they were, and upon such an apparatus. It appears from the report of those gentlemen, that it consisted of 140 feet of tubing, of which 26 feet were coiled in the furnace. With these proportions of tubing, no fault is found; but it seems from the diagram annexed to the report, that only 15 inches of expansion tube was attached to it (at least only that quantity was left unfilled with water,) which, supposing it to be of three inches diameter, the largest size used, is six inches less than the apparatus required. This in so small an apparatus, is a serious difference when worked at a very high temperature; still, however, under ordinary circumstances, the apparatus would have worked. The *damper* is not once mentioned in the report, nor does it appear that it was ever made the slightest use of during the experiments, so that the full force of the draught was admitted to the furnace at all times unchecked, even when it was loaded with fuel to repletion. This might suit the purpose of those who erected this apparatus with the express view of making it as dangerous as air, fire and water, recklessly employed, could make it; but what tradesman would introduce one so constructed into his employers premises? But more could yet be done to increase the dangerous tendency of this apparatus: and, accordingly in the absence of Mr. Walker, a stop-cock was introduced, which, cutting off the greater part of the circulation, left only *forty feet of the tubing* out of the furnace, to carry off all the heat that could be communicated from *twenty-six feet within it*, with a fire out of all proportion to those surfaces, and a draught totally unchecked. With the apparatus in this state—a state in which no man in his senses ever before thought of working one, and which, it may be safely asserted, had never before occurred since the introduction of warming by hot water—preparations were made for an explosion. The process of "igniting," "destroying," "fusing," "inflaming," and "charring," various substances, went on most prosperously, and, at length, the desired explosion took place, the fire was thrown violently out of the furnace, and the ignited embers were scattered in profusion over every part of the place. Some gray calicoes spread around the furnace were alone wanting

to complete the scene, and put the finishing touch to this exquisite specimen of Perkins' hot-water apparatus.

But can it be seriously intended that an apparatus thus erected, and thus worked, is to prove the *danger*, and caution the public against the use of Perkins' system of warming by means of hot water? Is the abuse of a thing to be used as an argument for discontinuing the use of it? To what invention will not such reasoning apply? Steam-engines, railways, all must vanish before it, since, if great skill and care are not employed in their construction, and much caution and prudence in their application, they become imminently dangerous.

Messrs. Craft and Stell's premises were burnt down; the fire was caused by the bursting of the furnace-coil of the hot water apparatus, which threw the ignited embers among combustible materials, and set them on fire. But was common precaution used in placing the furnace in such an apartment (the very walls of which were boards,) and in surrounding it with grey goods? Would not a vault or a cellar have been a more appropriate place? and had the furnace been so situated, would the premises have been destroyed by the explosion which took place? This explosion was caused by a stoppage in the pipes; the water in them was frozen. It appears the warehouse was closed on Saturday evening, and not opened again before Monday morning: the frost being intense during the two intervening nights. A fire lighted in the furnace on Sunday morning was an obvious means of preventing such an occurrence; and it might have been supposed would have naturally suggested itself. Weather of such extreme severity is not very frequent in England, and the short time required for such a purpose (the necessity of it being evident) could scarcely be considered a desecration of the day. And even after the pipes were frozen up, common attention on the part of the fireman would have shown him the circumstances in a few minutes after the fire was lighted; the want of any circulation in the pipes being always indicated by their great heat near the furnace and their coldness in every other part. Had the fire then been raked out and the most exposed parts of the pipes been thawed by the application of heat to them externally, the circulation might have been restored, and all would have been well. No precautions, however, of any kind appear to have been taken, and the endeavor to force a circulation in the state the pipes were then in, produced the disastrous event that ensued. It is not the object of the patentee to throw blame upon others, he only wishes to show that his apparatus may be used with perfect safety, if the same care and attention be bestowed upon it, as is required by every other mode of warning.

There are some palpable errors in the report of Messrs. Davies and Ryder in their remarks upon the inequality of the heat given out by the pipes in the Natural History Museum, and the manner in which they attempt to account for it. They observe, that the heat in those pipes had been repeatedly stated to become the greatest at places remote from the furnace, and that the fact was confirmed by their own observations and subsequent experiments; and

in another part of the report they account for it by stating, that the minute bubbles of steam which rise rapidly to the upper part of the flow-pipe become there condensed into water again. From this acknowledged fact, they deduce the inference that, "as condensed steam wherever it occurs, produces about seven times as much heat as the same quantity of water at the same temperature, we have at once a reason for the heat of the pipe being generally greater at a distance from the furnace than contiguous to it." This is a manifest absurdity, for it is impossible that increase of heat can be produced by the condensation or cooling of steam. There cannot, therefore, be the slightest doubt that the statement of those gentlemen, that the heat is generally greater at points distant from the furnace than contiguous to it, is founded altogether in misconception and error. Another observation from which erroneous conclusions are drawn, is, that the temperature of the pipes is influenced by the variation of their internal diameter, this is not the case; the amount of heat conducted off, depends upon the surface exposed to the atmosphere, and not upon the internal diameter. Equal surfaces exposed to the atmosphere give off equal heat, whatever variation there may be in the velocity of the current of the water within the tubes.

The objection No. 1, relative to the possibility of an explosion from the inadequacy of the expansion tube, has been already met in the description of the apparatus in the former part of this paper; and overfilling the apparatus is impossible while the filling pipe is made the only medium of supplying it, and the screw-plug of the expansion tube is at the time of filling taken off.

In objection No 2., it is inferred that, because a pint of water may be converted into steam capable of exerting a powerful mechanical force, and present a pressure upon the tubes "sufficient to ensure their destruction," that such must inevitably be the case. Ten years experience has, however, proved the contrary; any quantity of steam which can be formed in an apparatus properly put up, the tubes are perfectly able to resist.

Objection No. 3, supposes the presence of hydrogen gas in the apparatus to be a common occurrence, instead of a very rare one; and where it has occurred, it has invariably arisen either from a faulty construction of the apparatus, or great neglect in its management. Admitting, however, that hydrogen gas has been formed within the pipes, no explosion can be produced by its expansion, as its expansive power is far less than that of water; neither can it explode within the pipes by ignition, as it requires an admixture of atmospheric air to render it explosive.

The remaining objection urged against the use of the apparatus is, the danger of explosion from stoppage in the pipes. This is a very unusual occurrence, and rarely happens except in seasons of very severe frost, when it may always be prevented by keeping a slumbering fire. The addition of three per cent. of salt to the water will also prevent it from freezing, even during such severe weather as was experienced last winter. The objection of stoppages by extraneous substances getting into the pipes, is scarcely worth

notice; the last operation of the workman in erecting a new apparatus is always to scour the pipes well through by means of a forcing pump, and then to close them up. How then can any substances get into pipes thus closed in every part, except by design?

It seems that previously to putting up the apparatus at Mr. Walker's those at the Natural History Museum, and Messrs Vernon & Company's, had been tried and found "unsatisfactory;" that is to say, they could not be sufficiently overheated. The patentee can show Messrs. Davies and Ryder some hundreds of apparatuses that would prove still more "*unsatisfactory*" to them than those just named. Since the foregoing remarks were written, Mr. Perkins has received a letter from Sir Robert Smirke, in which that gentleman says, "I am sorry to know that you think the partial use of my answers to the questions sent to me from Manchester (as printed in the report there) has been in any degree prejudicial. If it has been so, I think you ought in the reply you are about to publish, to counteract that effect, especially as it was one not at all intended. They should, at least, have directed equal attention to my remark that complete security, under every contingency, might be obtained from the adoption of your safety-valves."

Comment upon this is unnecessary; it only strengthens the feeling which the perusal of Messrs. Davies and Ryder's report has very generally produced, viz. that it is very unjust, and that the absurd experiments detailed in it were conducted with any view rather than that of candid investigation.

If those who possess the means of obtaining the information would make known the causes of all the fires that have come under their cognizance within the last eight or ten years, as far as they can be ascertained, the patentee is confident that such a statement would speak more in favor of his apparatus than the most labored arguments. There are not wanting, however, many persons even in Manchester itself, who, placing more confidence in their own knowledge of the apparatus, founded on several years' experience, than in the report, have unhesitatingly expressed their determination to continue the use of it as heretofore.

The safety-valves, alluded to by Sir Robert Smirke, have been but recently applied; and effectually provide for any casualty which can arise from a stoppage in the pipes.

In conclusion, the patentee begs that the Directors of Assurance companies, and the public generally, will not hastily form their opinion of Perkins' hot-water apparatus from the very erroneous reports which have been circulated respecting it, as it is his intention to request a committee of competent gentlemen connected with Insurance offices to inspect an *apparatus properly constructed* and which he *wishes* to have subjected to any test to which such committee may think proper to submit it.

6, *Francis Street, Regent Square,*
April 10th, 1841.

EXTRACT FROM THE ANNUAL MESSAGE OF THE GOVERNOR OF NEW JERSEY.

"There are questions of some importance depending between the State and the Camden and Amboy railroad and transportation company, and also between the State and the New Jersey railroad and transportation company, which will require the attention of the legislature. They arise upon the extent of the claims of the State for transit duties, and per centage on the transportation of passengers, reserved in their respective charters. I do not call it a controversy, because it results from a difference of opinion between the officers of these companies and the officers of the State, as to the true construction of those acts, and from no disposition, as I am assured, to avoid on the part of the companies a faithful discharge of their liabilities to the State. It is proper that the subject should be adjusted, and the right ascertained. The State can have no disposition to encroach upon the companies, but her just claims against them must be insisted on, and it will be your duty, representing her interest at this time, to see them maintained and recovered. The question affects the revenue of the State, and should therefore not be passed by.

"By the act of March 1832, provision was made for securing to the Delaware and Raritan canal and the Camden and Amboy railroad and transportation companies, (which companies had by an act of the preceding year been united into one,) the exclusive right, during the continuance of their charter, of transporting passengers and merchandize by railroad between the cities of New Yord and Philadelphia. The act declares that no other railroad should be built between those cities, to compete with the companies named, without their consent, reserving only to the State the right to grant a charter for a road between New Brunswick and the Hudson, which reservation was doubtless made from the fact that an application for such a charter was then pending, and which became a law in a few days thereafter. By this act great power was conferred, no less than the entire and exclusive right of way, by railroad, across that part of the State over which not only the travelling between the two great cities of New York and Philadelphia, but from all parts of our extended and rapidly growing country, must pass. The company, as a compensation for this important grant, agreed to transfer to the State one thousand shares of the capital stock of the companies, and further stipulated that the dividends on that stock, and the transit duties on the road, should amount to $30,000 annually. The dividends and transit duty do not, of late years, amount to that sum, but there is a deficit of several thousand dollars, and yet under the guarantee, the companies are bound to pay the full amount of $30,000. This stock was transferred and is still the property of the State, and the $30,000 are annually paid into the State treasury.

"Had no subsequent acts been passed, the present difficulty would not have occurred, but the legislature, by the act of March, 1837, authorized these companies to erect a railroad from Trenton to in-

tersect the New Jersey railroad and transportation company, and reserve to the State the same transit duties as were reserved on the road from Camden to Amboy. This transit duty the companies claim the right to carry to their account, to make up the $30,000 for which they have given a guarantee to the State. The effect of this is to deprive the State of all transit duty under the act of 1837, until it shall amount to more than the deficiency under the first act required to make up the $30,000. The loss to the State by this construction will be several thousand dollars annually.

"I think this, from any view I can take of it, a perfectly plain question, and that the transit duty under the act of 1837 must be paid, independent of any provisions in the act of 1832.

"They have no connection with each other, and must stand on independent grounds. This would be the construction if there was nothing in the last act upon the subject, but the fifth section of that act decides the question by declaring, that nothing in that act shall impair the right of the State to the shares it then held in the companies, or the interest or dividends accruing thereon, and to the transit duties for the transportation of goods and passengers, but that the State shall be and remain entitled to their said rights, privileges, and emoluments, as fully as if this act had not been passed. This is the first question depending between the State and these companies.

"The remaining question with the Camden and Amboy company, is of much less consequence, yet it is right and proper that it should be adjusted and put to test. The companies insist that by the 23d section of the original "act to incorporate the Camden and Amboy railroad and transportation company," passed 4th of February, 1830, the 3d section of the act of February 4th, 1831, and the 3d section of the act of 15th of March, 1837, they are bound to pay a transit duty only upon such goods and passengers as are brought from, and destined to, places beyond the bounds of this State. I do not perceive by a recurrence to those acts, that there is any thing to limit the transit duty to the decision of the question, where the goods or passengers come from or are going to, provided they pass over the road from South Amboy to Bordentown or Camden, or from New Brunswick to Trenton.

"The questions with the New Jersey railroad and transportation company, are of a somewhat different and more doubtful character. The first refers to the time when, by the charter, they are bound to pay a tax of one quarter of one per cent. upon their capital stock. The language of the 10th section is "that from and after the completion of the said railroad, and *after the expiration of five years*, the said corporation shall pay into the treasury of this State, yearly and every year, a tax of one quarter of one per cent. upon their capital stock paid in," and after ten years the tax shall be increased to one half of one per cent. Is this tax of one quarter of one per cent. payable at the completion of the road, or in five years thereafter? It seems to me that the legislature intended to name five years for completing the road, and that the company should pay the tax at the end of that time. That no tax should be demanded while the

road was in progress of building was reasonable, and it was also proper that time for its completion should be allowed, but it is not so obvious that the State should wait five years after such completion; nor do I think such is the intention of the law. The remaining question arises under the same section which provides "That in addition to the tax, if at any time thereafter any railroad should intersect or be attached to this railroad, so as to make a continued line of railroads carrying passengers across the State of New Jersey, between the States of New York and Pennsylvania, then the treasurer of the company is required to make return of the number of passengers and the number of tons of goods transported over the *whole line of the road*, and to pay to the treasurer of the State at the rate of eight cents a passenger, and twelve cents for every ton of goods so transported thereon *in manner aforesaid*." The question is made upon the words, "the whole line of the road." The company have a depot at the city of New Brunswick, but their road extends almost two miles further towards the city of Trenton, and it is contended that for goods carried from Jersey City to New Brunswick, they are not bound to pay any transit duty, because that is not the whole line of the road. The charter of the company authorises them to construct a road from Jersey City to the city of New Brunswick, and it is understood that the chartered limit of the city of New Brunswick extends as far south as the termination of the road, but in the case of goods unloaded at New Brunswick, they claim an exemption from the demands of the State. The words of the charter justify this construction, and I cannot but think that such is the true spirit and intention of this section. In construing statutes we must look into their spirit and object. This tax was not to be imposed until a road should be built intersecting the New Jersey railroad, and then only on goods passing over the whole line. I incline therefore to believe that the company is right in this particular, and that it is not bound to pay for goods and passengers unless they go over the whole line. This exemption, it will be observed, is only claimed to passengers and merchandize that stop at New Brunswick, and can effect only a minor portion of their business: for all the charges on passengers and goods that do so pass over the whole line, which embraces the large amount of their business, the company have paid with promptness.

WESTERN AND ATLANTIC RAILROAD REPORT.

ENGINEER'S OFFICE, WESTERN AND ATLANTIC RAILROAD,
MARIETTA, GA. *October* 18, 1841

SIR: I have the honor to submit the following report upon the progress of the Western and Atlantic railroad.

Very respectfully, your obedient servant,
JAMES S. WILLIAMS, *Chief Engineer.*

To His Excellency
CHARLES J. McDONALD.

ENGINEER'S OFFICE, WESTERN AND ATLANTIC RAILROAD.
MARIETTA, GA., *October* 15, 1841.

GENTLEMEN: I have the honor to report concerning the progress of the Western and Atlantic railroad during the last quarter, that the amount of work done is as follows, viz:

185,285 cubic yards grading.
5,157 perches of masonry.
66,780 feet, board measure, of weather-boarding for bridges, delivered.
4,000 feet, board measure, of bridge timber, delivered.
1,919,925 feet, board measure, of timber for superstructure, delivered.

The value of which is - - - - -	$110,933 93
The amount paid - - - - -	92,582 10
The amount of balances retained as security -	18,351 83
The amount of reserved balances paid on the completion of contracts since the commencement of the quarter is - - - - -	10,341 28
The total expenditures from the commencement of the work up to the present date, on account of surveys, construction and the engineer service, is -	2,181,272 06

During the quarter, contracts have beem made on favorable terms for laying the timber part of the superstructure of the road between the southeastern terminus and the Etowah river, a distance of about 50 miles. The contractors are gentlemen whose testimonials of energy and experience in the kind of work they have undertaken, promises faithful and speedy compliance with their engagements. Arrangements have been made by the purchase of materials and apparatus, and by building the necessary tanks for subjecting the timber of the track and bridges to the preservative process of Dr. Earle.

The location of the road has been extended from its present southeast terminus, about 1,200 feet in order to occupy ground suitable for the erection of depot buildings. Proposals for executing the grading of this extension have been called for by public advertisement.

The original contractor for the tunnel having failed to comply with his agreement, the contract was declared forfeited, and arrangements made for the continuation of the work by engaging a contractor to complete the excavation of the approaches, and by inviting proposals from experienced tunnel contractors for the excavation of the tunnel proper. The excavation of the approaches is progressing steadily. Several proposals have been received for the completion of the tunnel. The indications of geological formation, apparent from the present state of the excavations, lead us to expect favorable material for the safe and easy completion of the work.

I submit the following estimate of amounts required for the prosecution of the work:

To fulfil existing contracts for the grading, masonry, bridges and superstructure, not including iron rails, chairs and spikes, the amount required is	$408,764 11
For the purchase and laying of iron rails, chairs and spikes for the road south of the Etowah river	254,640 00
For the completion of the road besides the above-mentioned sums, there will be required for grading, masonry and bridges, not yet contracted for, including the tunnel through Little Blue ridge	226,400 00
For the superstructure north of the Etowah river, (about 95 miles) - - - - -	779,000 00
For the necessary depot buildings, work shops, turn tables, car houses, passenger houses, water stations, store houses and machinery in workshops -	76,000 00
For locomotive engines, passenger and freight cars	150,000 00
	$1,894,804 11
Adding 5 per cent. upon this amount for engineering, superintendance and contingences -	94,740 20
We have, as the sum required for the completion of the work, and for putting it in operation -	$1,989,544 31

Among matters which at present claim your attention, I would urge as immediately necessary, the erection of depot buildings, water stations and warehouses, and the purchase of locomotive and stationary machinery. The plan of buildings should be made suitable for the business of an extensive and active trade, the style plain and substantial. In the purchase of machinery, we should be governed not by the fancy or prejudice of those who uphold the claims of a particular model of engine to the exclusion of all others; but by the very full experience of the working of the different kinds of engines made in our country. The cost of locomotive engines is nearly equal in several of our manufactories. The difference in the service they perform is to be measured principally by the cost of repairing them. In the question of choice among the different models, too much stress is laid upon a supposed intrinsic quality or power of traction that one model may possess over another. The power of traction is the result of adhesion, and this the effect of gravity. Therefore, in choosing among the approved kinds of engines, faithfulness and accuracy of workmanship are mainly to be considered. This subject is one of great importance. A choice should be made of a particular kind of engine for our road. There should be but one kind employed, and not more than two classes of that kind: one for the heavy duty of transporting freight, the other for the rapid passenger srvice. The advantages on the score of convenience and economy in the similarity of construction of all machines on our road is obvious.

The portions of the road that have been completed are in excellent condition. The drainage upon which the character of the road

surface so much depends, is in good order. No damage worthy of notice has resulted from the frequent heavy floods and freshets.

The progress of the work is as rapid as could be expected under the unfavorable circumstances of scarcity of mechanics and laborers, and the depreciated value of our currency.

I have the honor to be, very respectfully,

Your ob't servant,

JAMES S. WILLIAMS, *Chief Eng'r.*

To the BOARD OF COMMISSIONERS
of the Western and Atlantic railroad.

NEW YORK AND ERIE RAILROAD.—We are happy to be able to place before the public the following exhibit of the revenue on this important work of internal improvement. Its results exceed the most sanguine expectation, and when it is considered that the part of the road completed does not reach any important point of communication or trade, it would seem that scarce any calculation of the profits which will be derived from it when entirely finished, would be too large.—*New York Courier and Enquirer.*

"A statement exhibibiting the gradual increase of revenue upon the eastern division of the New York and Erie railroad, between New York and Goshen, from the opening of the road on the 23d September to 30th October 1841—33 working days.

Sept 23.						Average of each day.
1st week, 3 days, revenue					$ 476 40	$158 80.
2d " 6 "	"	-	-		1178 52	196 42.
3d " 6 "	"	-	-		1300 32	216 72.
4th " 6 "	"	-	-		1727 46	287 91.
5th " 6 "	"	-	-		2274 90	379 15.
6th " 6 "	"	-	-		2426 46	404 41.

NOTE.—The receipts upon the 28th, 29th and 30th of October, average $409 06 per diem."

LOCOMOTIVE STEAM EXCAVATING MACHINE.—There is now exhibiting in New York, at the Fair of the American Institute, a machine, the invention of a Mr. Cochran, which is said to be fully worthy of the high commendations bestowed upon it as an immense labor-saving machine. On an average one thousand cubic feet of earth may be excavated and placed in the cars in the course of a day; and the workmen have dubbed it the "Steam Paddy." "We hardly know," says a New York paper, "which most to admire, the perfect control which the engineer possesses over its diversified motions, or the vast amount of labor it performs in a given time." It operates equally well under water, and may be used in clearing out docks, digging canals, etc. Mr. Cochran has a contract in negotiation with the British Government, to dig a ship canal three and a half million cubic yards in length, for which they offer fifty cents per yard. Mr. Cochran says he is satisfied he can accomplish the work at an expense to himself of from five to ten cents per yard, which would leave a pretty fair profit as times go. He has patented his machine in England, and in most of the kingdoms of Europe, and he now proposes to get up a company to contract for all the heavy works of excavation."